



Applying economic incentives to increase effectiveness of an outpatient weight loss program (TRIO) – A randomized controlled trial



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ABSTRACT

The prevalence of overweight and obesity has more than doubled in the past three decades, leading to rising rates of non-communicable diseases. This study tests whether adding a payment/rewards (term reward) program to an existing evidence-based weight loss program can increase weight loss and weight loss maintenance. We conducted a parallel-group randomized controlled trial from October 2012 to October 2015 with 161 overweight or obese individuals randomized to either control or reward arm in a 1:2 ratio. Control and reward arm participants received a four month weight loss program at the LIFE (Lifestyle Improvement and Fitness Enhancement) Centre at Singapore General Hospital. Those in the reward arm paid a fee of S\$165.00 (1US\$ = 1.35S\$) to access a program that provided rewards of up to S\$660 for meeting weight loss and physical activity goals. Participants could choose to receive rewards as guaranteed cash payments or a lottery ticket with a 1 in 10 chance of winning but with the same expected value. The primary outcome was weight loss at months 4, 8, and 12. 161 participants were randomized to control ($n = 54$) or reward ($n = 107$) arms. Average weight loss was more than twice as great in the reward arm compared to the control arm at month 4 when the program concluded (3.4 kg vs 1.4 kg, $p < 0.01$), month 8 when rewards concluded (3.3 kg vs 1.8 kg, $p < 0.05$), and at month 12 (2.3 kg vs 0.8 kg, $p < 0.05$). These results reveal that a payment/rewards program can be used to improve weight loss and weight loss maintenance when combined with an evidence-based weight loss program. Future efforts should attempt to replicate this approach and identify how to cost effectively expand these programs to maximize their reach. This study is registered at www.clinicaltrials.gov (Identifier: NCT01533454).

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1. Introduction

The prevalence of overweight and obesity has more than doubled in the past three decades (Stevens et al., 2012). This increase has led to rising rates of non-communicable diseases, public and private sector health expenditures, and absenteeism and presenteeism among employees (Church et al., 2007; Finkelstein et al.,

2008; 2010; 2009; Singh, 2002). As a result, governments, insurers, and employers worldwide are increasingly looking for strategies to reverse this trend. The encouraging news is that the Diabetes Prevention Program (D. P. P. R. Group, 1999) and other behavioral interventions have shown that as little as 5% weight loss among overweight adults can lead to sustained health improvements (Finkelstein et al., 2010). Several evidence-based behavioral interventions have shown weight losses of this level or higher. However, in the majority of cases, weight losses are not sustained (Pasman et al., 1999; Vidal, 2002; Wadden et al., 1998; Westerterp-Plantenga et al., 1998).

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A primary challenge for successful weight loss is that many individuals are present-biased (Thaler, 1991). They are far-sighted when making decisions between two periods in the future but myopic in the short term, and especially in the very short term when it comes to decisions related to food consumption and physical activity (Read and Van Leeuwen, 1998). Behavioral economics offers several remedies to address this bias. One remedy is to offer rewards for successful weight loss or related behaviors in efforts to increase the short-term benefits. Behavioral economists further argue that providing rewards in the form of a lottery with a small chance of a larger reward should be more effective than a cash payout of the same expected value because people tend to overestimate their chances of winning, and thus they may work harder to obtain the reward (Kahneman and Tversky, 1979). In fact, there is evidence that both cash and lottery rewards are effective in encouraging weight loss and greater levels of physical activity (Butsch et al., 2007; Cawley and Price, 2009; Finkelstein et al., 2008; Finkelstein et al., 2007; Jeffery et al., 1993; Jeffery and French, 1999; Jeffery and Wing, 1995; Kullgren et al., 2013).

Although potentially effective, rewards programs are expensive and it may be that the magnitude of reward required to generate clinically significant and sustained weight loss is greater than what third parties are willing to pay. One strategy to offset this cost is to charge a fee to have access to the rewards. This fee reduces third party costs because those who pay in but do not reach the goals will offset costs for those who do. As a result, depending on the size of the fee and rewards offered, and the extent of weight loss among participants, these programs could be cost neutral or even profitable. If the potential rewards are large relative to the fee, there is also likely to be significant uptake (Farooqui et al., 2014).

There is an additional benefit of charging a fee. Behavioral economists have shown that people value gains and losses differently and that the 'pain' felt from a loss of \$1 is greater than the benefit of receiving \$1 as a reward (Kahneman et al., 1991). As a result of loss aversion, *ceteris paribus*, weight loss programs that require participants to put their own money at risk should be more effective than programs that solely rely on rewards. However, the two studies that tested this theory via the use of deposits returned if a weight loss goal was achieved showed disappointing results (Jeffery et al., 1993; Kullgren et al., 2016). Yet, three studies that incorporated daily deposits with matching were effective, at least during the intervention period (John et al., 2011; Kullgren et al., 2016; Volpp et al., 2008). All three strategies allowed participants to put a small amount of money at risk each day (up to \$3) that was matched if a weight loss goal was met or lost if the goal was not met. Using this approach, Volpp et al. showed that those randomized to the incentive arm had 14.0 lb ($P = 0.006$) greater weight loss compared to controls after 16 weeks. However, by 7 months differences were no longer statistically significant. John et al. extended the intervention period to 32 weeks and the follow-up period to 36 weeks beyond that. They again found that the incentive strategy generated more weight loss than control at the end of the intervention period but that the weight loss was not sustained. Kullgren et al. also showed the approach to be effective during the 24 week intervention period despite the fact that only 36% of eligible participants made deposits. However, 12 weeks later weight losses were again no longer statistically different from controls. These studies suggest that an approach that relies on the willingness of individuals to risk small daily deposits, even with the chance of receiving a reward, does not generate sustained weight loss beyond the intervention period. This approach is also unlikely to be financially viable for the majority of third party payers because participants have the option to cease making deposits when they believe they are unlikely to meet the target.

The goal of this effort, the Singapore-based (randomized) TRIO

on Incentives for Obesity (TRIO) is to explore an alternative approach that is expected to overcome these limitations. We test a strategy where, upon enrolment, individuals purchase either a cash or lottery-based rewards program that offers the opportunity for a significant return for meeting both shorter and longer-term goals. This strategy, which uses contingent rewards to address present biasedness, loss aversion, and probabilistic assessment bias is combined with an existing evidence-based weight loss program that individuals also willingly pay for. We test whether this highly scalable approach is effective during the four months that the program and rewards scheme is in effect, the subsequent four months when only rewards are available, and in the final four months when no program or rewards are offered. Secondary goals include testing whether there are any differences in outcomes between those who chose cash or lottery rewards and to explore third party costs in efforts to identify whether this approach would appeal to funders who may not wish to spend a significant amount of money on rewards for their overweight constituents.

2. Methods

2.1. Recruitment and study population

161 participants were recruited between October 2012 and October 2014 via multiple avenues, including posters and flyers at the local hospital and satellite clinics, advertisements in local newspapers, and by referring physicians. All publicity materials briefly explained the study design, eligibility requirements, and program entry fee, and directed prospective participants to a study website (<http://hssr.duke-nus.edu.sg/projects/trio>). The website informed participants that TRIO is a 12-month research study and that a weight loss program would be provided at a subsidized rate to participants. The website stated that rewards would be offered and that study participants would be expected to pay the subsidized rate for the weight loss program and for access to the rewards program. It also stated that participants would be expected to complete surveys and attend weigh-ins at key assessment points. All interested individuals were then asked to complete an online registration and screening form to determine eligibility or to provide a phone number for phone screening.

Eligible participants (1) were between ages 21 and 65 years (inclusive), (2) had a body mass index (BMI) of 25–40 kg/m² (inclusive), (3) were willing to be randomly allocated to one of two study arms, (4) were willing to pay an enrolment fee of S\$399.00 (1US\$ = 1.35S\$), comprising the subsidized fee of S\$234.00 for the Obesity Management (OBM) program and the fee of S\$165.00 to have access to the rewards scheme and (5) a stated willingness to participate in all assessments regardless of weight change or study arm assignment. Respondents reporting use of corticosteroids in the past 6 months were included after a 3-month wait on the expectation that they would not use corticosteroids during the course of the study. Those reporting major illnesses requiring hospitalization or surgery in the past 6 months were required to receive a physician's notice that they were certified fit to participate as were respondents who answered 'YES' to any of the Physical Activity Readiness Questionnaire (PAR-Q) questions (Thomas et al., 1992). Our original eligibility criteria excluded participants who answered 'YES' to any of the PAR-Q questions but after discussions with the lead clinician and with IRB approval we subsequently amended the criterion to allow participation but only after a doctor's approval was provided. We made this amendment to increase the pool of eligible participants.

Exclusion criteria included pregnancy or lactation, diabetes mellitus or end-stage renal disease, ischaemic heart disease requiring intervention in the past 6 months, thyroid disease that

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